Appendix B
2020 Travel Demand Analysis

B.1 Introduction and Setting

This document presents the travel demand methodology used for evaluating transportation improvements as part of the Legacy Parkway supplemental environmental impact statement (Supplemental EIS). The Legacy Parkway Supplemental EIS identifies the need for major highway improvements in the North Corridor, together with maximum future transit improvements as part of a coordinated multi-modal program (Shared Solution). The detailed discussions of the travel demand model that follow have as their starting point the Wasatch Front Regional Council (WFRC) travel demand model (version 3.2) (released February 2004) and various WFRC documentation including a memo describing “What’s new in Version 3.1” by WFRC staff.

B.1.1 Purpose and Organization of Report

This report has five sections.

- Section 1, Introduction and Setting, describes the purpose of the report.
- Section 2, Model Input and Assumptions, outlines the inputs and assumptions of the WFRC travel demand forecasting model, such as socioeconomic projections and highway and transit networks.
- Section 3, Travel Demand Modeling Process, reports the procedures that were used to develop travel demand forecasts for the Legacy Parkway project, using the WFRC model, and explains the basic process used by WFRC, and the changes in the modeling process that were incorporated by the study team led by FHWA and the Corps.
- Section 4, Changes to the WFRC Model and Processing Model Results, highlights specific post-model adjustments to the WFRC model incorporated to:
  - Account for factors not considered by the model
  - Process raw traffic volumes and transit assignments in the WFRC travel demand model to create “passenger car equivalent volumes” consistent with the procedures in the 2000 *Highway Capacity Manual* (Transportation Research Board 2000).

- Section 5, Supporting Alternatives Analysis, was added at the request of the federal lead agencies after the Draft Supplemental EIS was published to provide a richer understanding of the traffic analysis evaluated to understand and compare alternatives.

Note that it is difficult to separate the WFRC travel demand model from modeling performed specifically for the Legacy Parkway Project. The WFRC travel demand model refers to all modeling processes and data inputs. In order to test alternatives, certain data inputs have been changed but all other data inputs and modeling processes have not been changed. This report describes both the WFRC modeling processes and data inputs and will highlight, where appropriate, data inputs have been changed to reflect modeling performed specifically for the Legacy Parkway Supplemental EIS.

B.1.2 Background of Modeling Domain

In the past, WFRC maintained two separate models, one covering the modeling domain of the Salt Lake Urbanized Area and one covering the modeling domain of the Ogden Urbanized Area. In addition, the Mountainland Association of Governments (MAG) maintained a travel model of the Provo-Orem Urbanized Area. The Salt Lake Urbanized Area consisted of the southern portion of Davis County, generally south of but including portions of Farmington, as well as urbanized areas of Salt Lake County. The modeling domain for the Ogden Urbanized Area was contiguous to and north of the Salt Lake Urbanized Area. The modeling domain for the Provo-Orem Urbanized Area was contiguous to and south of the Salt Lake Urbanized Area.

Beginning in approximately 1999, WFRC and MAG began a process to combine the three separate models into a single regional travel demand model, built upon a less formal process that began earlier within WFRC to combine the models for the Salt Lake and Ogden Urbanized Areas. The less formal process began by ensuring that “external trips” from the Salt Lake model and the Ogden Urbanized Area model were identical. The more formal process reviewed individual trip purposes and redefined the definition of “external trip” as well as other improvements facilitated through consultant support. External and internal trips are identified with respect to their origin and destination relative to the four-county region. Now one single travel model covers the four contiguous counties. Salt Lake, Davis, and Weber Counties are within the WFRC planning area, and Utah County is within the MAG planning area. The following discussion includes data reported across the four-county area, relating to totals from the entire modeled area. Data reported from the WFRC area covers only Salt Lake, Davis, and Weber Counties.

B.1.3 Description of the North Corridor

The North Corridor is explained in detail elsewhere in the Supplemental EIS, but from a modeling standpoint, it generally refers to the area that parallels I-15 from Kaysville to the northern part of Salt Lake City. The North Corridor includes all or parts of Salt Lake City, Salt Lake County, North Salt Lake, Woods Cross, Bountiful, West Bountiful, Centerville, Farmington, Kaysville, and Davis County. Figures 1-1 (Regional Location) and 1-2 (North Corridor) in the Legacy Parkway Final EIS illustrate the regional location and the specific limits of the North Corridor, respectively. It is pointed out that the modeling domain includes the four urban counties: Salt Lake, Davis, Weber, and Utah County. Consequently, this report will utilize, as needed, information from the four urban counties, the three urban counties that fall within the WFRC planning area, or just the North Corridor. The use of four county total values is typically included as a matter of convenience in summarizing the results of the entire modeling domain, but smaller geography results are provided where necessary based on consistent geographic definitions built from the Traffic Analysis Zone (TAZ) level of detail.

B.2 Model Input Assumptions

The WFRC travel demand model uses a variety of input data as the basis for forecasting future traffic and ridership volumes in the North Corridor. The three key inputs are:

- Land use and socioeconomic data (as a basis for estimating trip generation);
- Highway network definition, including the physical and operating characteristics of highways and arterial streets within the model area; and
- Transit network definition, describing the transportation modes, service levels, and operating characteristics of the public transit system.

Additional information on modeling input and assumptions is included in Section B3.2.2 (*Transit Network Assumptions*).

B.2.1 Land Use and Socioeconomic Projections

B.2.1.1 Source of the Projections

The socioeconomic data sets developed and maintained by WFRC in coordination with local governments are the basis of estimating future travel demand within the region. These data also support a variety of other comprehensive planning activities throughout the region. This section describes the development and application of the socioeconomic data, in particular the forecast population and employment.

To provide reliable projections of population, land use, and other parameters for planning, the counties and communities of the Wasatch Front region have maintained a cooperative process through WFRC for nearly thirty years. The process has generally relied on the state's Utah Process of Economic and Demographic (UPED) model for regional and county control totals of population and employment. Regional and county totals need to be assigned to more specific locations, which respect land constraints at the small area level by WFRC. In April 1992, WFRC published *Wasatch Front Regional Planning Projections Technical Report 29*, which introduced the Stratified Iterative Dis-aggregation (SID) method of projecting socioeconomic data on geographic areas smaller than the county level. The basic concept underlying SID is to use historical growth rates to produce TAZ level projections, which are then summed to county and regional control totals. The latest TAZ projections developed by WFRC were produced during 2003 using a modification of the SID method, with control totals published in the *2003 Economic Report to the Governor*, and are the basis of the travel demand projections used in the February 2004 WFRC model provided for the Legacy Parkway Supplemental EIS project.

B.2.1.2 Methodology for Developing Projections

There are four basic components to the projections methodology: collecting base data, obtaining control totals, calculating projections, and reviewing projections. These are discussed below.

Collecting Base Data

Base data for population and households come from the 2000 Census SF1 dataset at the census block level. Census blocks are summed to the TAZ and census tract levels.

Base employment data originally came from the 3rd Quarter, 2001 Utah Department of Workforce Services ES 2002 database for the WFRC model development and calibration. WFRC periodically inputs updated data as it becomes available. Once base population and employment were collected, the land supply was examined and mapped by WFRC. Land that was deemed un-developable due to environmental constraints was taken out of the total and density was calculated using the total land available for development. The developable land was further classified as residential or commercial using the master plans from each city and county.

Obtaining Control Totals

Control totals for the years 2002–2030 for population, households, and employment were provided at the county level by the Governor's Office of Planning and Budget (GOPB), as published in the *2003 Economic Report to the Governor* (Utah Governor's Office of Planning and Budget 2003). Both GOPB and WFRC staffs collaborate on the review of these county level totals before their publication. The UPED is a hybrid economic-demographic model. UPED integrates a cohort-component demographic model with an economic base employment model. It generates long term demographic (population) and economic (employment) forecasts. The demographic component of UPED produces projections of births, deaths, and non-employment related in- and out-migration, while the economic component generates projections of employment and employment related net migration. The single most important driver of population growth or decline in this model is the growth rate of employment associated with a region's economic base.

The demographic component of the model employs the cohort survival population projection technique combined with econometric techniques for projecting the migration portion of population change. The UPED model begins with a census count base-year population distributed by age and gender. The model then incorporates specific assumptions with regard to survival and fertility rates for each age and gender group and projects the change in population over the next five-year period. This produces a natural increase in population notwithstanding in- or out- migration. Non-employment related migrants, such as retirees or students, are added or subtracted to the base year population such that the result is a first approximation of the end of period population, that is, the expected end of period population in the absence of employment related migration. This value becomes input to the economic side of the model.

The economic component of UPED is an economic base employment model with the organizing concept of a labor market that controls employment related migration. The central premise of this model is that external demand for a region's exports is the primary driving force behind the region's economic and demographic growth or decline. This demand is registered in the model as basic employment, which is used to produce goods and services for export. Estimates and projections of basic employment by industry sector are input to the model.

The population in the region also demands goods and services. Local production of goods and services for local consumption requires labor. The demand for this labor is represented in the model as population-dependent employment. As the population of the region changes, this population-dependent employment will change in a like direction. In the model, the following factors determine the level of this category of employment.

- The population size and age structure.
- Trends in national per capita employment by industry (reflecting changes in national consumption patterns and productivity).
- The local differences from national production rates (reflecting regional differences in consumption patterns as compared with the U.S.) and the region's import structure.

The total demand for labor, measured in jobs, is the sum of basic and population-dependent employment.

Population (age and gender components), labor force participation rates, and multiple job holding rates determine the supply of labor (measured in terms of the number of jobs). Given the population from the demographic component of the model, if the supply of labor exceeds the demand for labor in sufficient numbers to yield an unemployment rate, which exceeds the equilibrium rate, employment related net out-migration occurs. On the other hand, if the unemployment rate is less than the equilibrium rate, employment related net in-migration results. If the labor market is in equilibrium, i.e., the unemployment rate is sufficiently close to the equilibrium rate, no migration occurs and the model proceeds to the next projection year. Non-employment related migration is also projected in this section of the model, since the population base for this category of migration is the natural increase population plus employment related to net migration.

In the event of migration, the size and composition of the population changes, this, in turn, affects the population-dependent demand for labor, thus inducing further migration. This is solved iteratively. When equilibrium is achieved, the model proceeds to the next projection year. The ending population of the current year becomes the beginning population of the following year.

UPED makes projections at the multi-county district (MCD) level. GOPB and WFRC then disaggregate the MCD projections to counties based on growth trends, available land, etc. The UPED does not have a land supply component as part of the model structure, thus the process of disaggregating the regional control totals provided by GOPB into county, city, and TAZ level forecasts is the responsibility of WFRC (or each appropriate Association of Governments). Final products from UPED include population by age and gender, components of population change, households, household size, and 66 sectors of employment.

Calculation of Projections

These control totals are used by WFRC to make TAZ projections using the Modified Stratified Iterative Dis-aggregation (MSID) process with several (off model/on model) enhancements (also by WFRC). Small area projections were controlled to the regional control totals of UPED but were initially allocated to each area using the Census 2000 population values, the Utah Department of Workforce Services employment values, as well as the zonal density for each data item. A growth rate for each variable is applied based on its density and corresponding historical growth trends from 1980 to 2000. The annual growth rates are applied for five years. At each five-year interval, densities are recalculated using the new population and employment and new growth rates are applied to the next five-year period. This process is repeated until the horizon year (2030) is reached. For more information, refer to *Wasatch Front Region Small Area Socioeconomic Projections: 2002–2030* (Wasatch Front Regional Council 2003a). The accuracy of past land use forecasts is controlled in several steps by the accuracy of the control totals provided by the Utah Office of Planning and Budget and the small area forecasts developed by the WFRC. Each of these agencies, as well as the individuals who assist these agencies, has tracked historic accuracy by various statistical and non-statistical means. As part of the WFRC Technical Report # 39, a brief review of historic accuracy was offered. In this report, a brief review of historic projections in Salt Lake County concluded, “Historically, the projections have tracked well with the actual trends.” Although the Supplemental EIS uses an updated set of socioeconomic forecasts included in Technical Report #42, the methodology and results are considered consistent with earlier forecasts. The Utah Office of Planning and Budget also provides *An Analysis of the Accuracy of UPED’s Historical Projection Work* (April 2001), which makes several observations, notably that “Utah’s projection history includes periods of both over and under projecting population.”

Interim year projections, such as projections used for the Legacy Supplemental EIS, make use of published interim year projections of WFRC (and MAG). At the time of the Legacy Final EIS, the year 2020 was the horizon year of WFRC Small Area Projections. In order for the Supplemental EIS to remain consistent with the Final EIS, the interim year 2020 of the WFRC projection horizon (year 2030) has been used. The *Wasatch Front Urban Area Long Range Transportation Plan Update, 2004–2030* (WFRC long range plan) (Wasatch Front Regional Council 2003b) includes projects and projections to the year 2030. The Legacy Parkway Supplemental EIS used the year 2020 land use projections and applied those to the list of highway and transit projects included in Phase I and Phase II of the three-phased transportation plan. Phase II of the plan extends to the year 2022, which was considered consistent with the year 2020 land use projections. A comparison between the population and employment projections in the Final EIS and those included in the Supplemental EIS are presented in Table B-1a and B-1b, respectively.

Table B-1a Comparison of Final EIS and Supplemental EIS Population Data and Forecasts

	Final EIS Base Year 1995 Population	Supplemental EIS Base Year 2002 Population	Final EIS Forecast 2020 Population	Supplemental EIS Forecasts 2020 Population
Salt Lake County	819,000	924,000	1,302,000	1,284,000
Davis County	218,000	250,000	355,000	347,000
Weber County	174,000	200,000	284,000	287,000
Urban Area Total	1,211,000	1,374,000	1,941,000	1,918,000

Note: Population summaries in the travel demand models may vary slightly from published values due to rounding of disaggregate forecasts of household size. Population and employment are rounded to the nearest 1,000.

Table B-1b Comparison of Final EIS and Supplemental EIS Employment Data and Forecasts

	Final EIS Base Year 1995 Employment	Supplemental EIS Base Year 2002 Employment	Final EIS Forecast 2020 Employment	Supplemental EIS Forecasts 2020 Employment
Salt Lake County	447,800	522,000	753,600	734,000
Davis County	73,000	89,000	133,200	124,000
Weber County	76,500	84,000	126,200	129,000
Urban Area Total	597,300	695,000	1,013,000	987,000

Note: Population summaries in the travel demand models may vary slightly from published values due to rounding of disaggregate forecasts of household size. Population and employment are rounded to the nearest 1,000.

Review of Projections

The projections were subject to several rounds of review and revision. The projections are reviewed by individual jurisdictions (cities and counties within WFRC) for consistency with boundaries, the land use element of their Master Plans, and reasonableness. By forming a Working Group, WFRC allowed the review of the final socioeconomic projections by local “experts” including experienced land use planners in the region, state government economists, and other interests. The following list identifies the entities that comprised the WFRC Working Group. According to WFRC, the Working Group concluded that the methodology was sound and the results were reasonable at the regional level. The following entities comprise the working group.

- Weber County
- Davis County
- Sierra Club
- Envision Utah
- Town of Herriman
- Homebuilders Association of Greater Salt Lake
- Utah Department of Transportation
- Utah Transit Authority
- State Data Center
- Greater Ogden Area Board of Realtors
- West Valley City
- Bureau of Economic and Business Research
- Sandy City
- Governor’s Office of Planning and Budget

In addition to land use, population, and employment, auto ownership is also an important variable in forecasting future travel demand, but is calculated from other socioeconomic data. The socioeconomic and land use forecasts have been updated from those used in the demand forecasts performed for the Legacy Parkway Final EIS and I-15 North Corridor Draft EIS. A more detailed discussion of current land-use and socioeconomic forecasts, by county, city and TAZ, along the Wasatch Front is included in *Wasatch Front Region Small Area Socioeconomic Projections: 2002–2030* (Wasatch Front Regional Council 2003a).

B.2.1.3 Summary of Socioeconomic Projections in Wasatch Front

Population

Population along the Wasatch Front (Weber, Davis, and Salt Lake Counties) is expected to grow from about 1,374,000 in 2002 to approximately 1,918,000 in 2020, an increase of 40 percent. Increases in population density are also projected throughout much of Davis County resulting from a combination of infill development in the more developed areas of the county and the continued spread of development in the presently undeveloped portions of the county. This increase in population, and to a lesser extent population density, will contribute to increased traffic volumes on the major transportation facilities in Davis County.

Households

Households for the three-county area are projected to increase from about 450,000 in 2002 to over 677,000 in 2020, or over 50 percent. The growth rate for households is higher than population because household size is forecast to continue to decrease over time. According to the WFRC, national trends support a declining household size, with a more significant reduction in household sizes in the Davis County, according to the Utah Office of Planning and Budget, due to the increasing urbanization of the area and the increasing loss of vacant or under-developed land.

Employment

Employment for the three-county area is projected to increase at close to, but slightly above the rate of population growth. Employment projections in Salt Lake County represents a slightly smaller share of the three-county employment as compared from the Final EIS to the Supplemental EIS, but remains the dominant employment location.

B.2.1.4 Summary Results

Overall, the growth projections for both population and employment in the Supplemental EIS for the year 2020 are slightly below growth projections in the Final EIS for the same year. This is due to revised regional control totals offered by the GOPB. The Utah Governors Office of Planning and Budget presently maintains growth forecasts to the year 2030 for which the year 2020 forecasts represent an interim year. During the Final EIS, growth forecasts for the year 2020 represented the furthest future year of official forecasts.

B.3 Travel Demand Modeling Process for Legacy Parkway Project

The travel demand model, its input data, and its application methodologies have changed since the Legacy Parkway Final EIS and I-15 North Draft EIS were prepared. The Legacy Parkway Supplemental EIS used the February 2004 WFRC regional travel demand model with changes to the highway and transit input networks as described in this memo. Consequently, the traffic forecasts used are not the same as those published in the earlier environmental documents. Developments to the WFRC travel demand model have been implemented by WFRC to improve the accuracy of forecasts produced. Selected application methodologies have changed in the WFRC model to reflect updated standards and recommendations from peer reviews. Updates to input data by WFRC have been made to better reflect current plans, and forecasts. The Legacy Parkway modeling included all of the latest advancements of the

WFRC model and methodologies with changes made to the input networks for the Legacy Parkway Supplemental EIS. The verification of the accuracy of the WFRC modeling process can be found in several internal documents to the WFRC, most recently including the "Wasatch Front Regional Council Speed Study," (Wasatch Front Regional Council 2003c). Informal model calibration efforts are often done on a model-by-model basis. The *Legacy Parkway Technical Memorandum: Integration of Mass Transit with Legacy Parkway* (Fehr & Peers 2004) also offers a brief review of the accuracy of the WFRC model for application in the North Corridor.

The travel demand models used for the I-15 and Legacy Parkway environmental studies in 1998-2000 were described in detail in their respective supporting documentation. Major differences between those models, input data, and methodologies are included in the discussion of the structure and four steps within the model that follow.

B.3.1 Land Use and Induced Growth

Land use projections for all the alternatives are the official 2020 data set for WFRC model, version 3.2 modified as described in Section 2.3.2 as Robust Transit Package B. The Supplemental EIS transportation analysis does not vary the land use assumptions from one transportation alternative to another. The WFRC model predicts future travel demand based on a full range of relevant factors, including projected land use. The model is not designed to address the concept of "induced growth," which can be described as variations in where and when growth may occur in relation to enhancements of transportation systems. Rather, the model projects future travel demand using land use projections of the local communities combined with the data described above from the GOPB. WFRC model analysis utilizes the following in projecting total travel demand.

- The future land use inputs to the WFRC model are based on plans that include Legacy Parkway and based on input from each community in the corridor.
- The calibrated base year conditions include base year trip rates and peak period factors that are unchanged to the future year.
- The WFRC model was calibrated to base year conditions that generally have low to moderate congestion.

Therefore, the total travel demand generated in the north corridor for the Shared Solution represents a reasonable maximum level. In response to comments received during the Supplemental EIS scoping process, the Supplemental EIS analysis considers the following two land use scenarios in addition to the official WFRC land use base: (1) a transit-supportive land use scenario included in the "maximum future transit" analysis (described in Chapter 3, *Alternatives*, and Section 2.3, *Integration of Legacy Parkway with Mass Transit*, of this Final Supplemental EIS); and (2) an alternative development pattern that would result from greater land availability in south Davis County under the No-Build Alternative (described in Section 4.1.3.3, *Impacts on Growth within and Beyond the North Corridor*). As described in Section B.5.1, *Possible Land Use Shifts under No-Build Alternative*, of this appendix, land use in the corridor for the No-Build Alternative could vary from the WFRC estimates because the No Build would make more land available for development in the corridor than anticipated by WFRC. Under a Legacy Parkway No-Build scenario, the 800 acres of developable land in uplands above the floodplain within the Legacy Parkway right-of-way and preserve would become available for development. Section 5.1 describes the sensitivity of the No-Build travel forecasts to the possible development of these acres.

Given the use of consistent land use assumptions in the analysis of all of the alternatives, the main variations in corridor travel demand from one alternative to the next relate to the different levels of accessibility and travel ease offered by the respective alternatives. The alternatives also offer different levels of modal availability. Specific travel routes and mode used by the total travel demand will be affected by the Shared Solution as discussed in Section B.3.3.4 of this appendix.

B.3.2 Highway and Transit Networks

B.3.2.1 Highway Networks

Highway networks include links defining all freeways, highways, arterial and collectors in each of the four counties. TAZs are connected into the highway network by links called "centroid connectors." Centroid connectors represent local streets and driveways in the model and serve to connect trips to the transportation network. The parameters that define a highway link generally are:

- Distance
- Free-flow travel speed
- Number of lanes
- Lane capacity
- Functional classification

Highway networks for the entire four-county region (including Utah County) as developed by WFRC and MAG were held constant for each of the alternatives evaluated for the Legacy Parkway Supplemental EIS except for changes necessary to reflect each alternative in the North Corridor. Highway networks in both the build and no-build conditions included a combination of programmed and non-programmed projects as included in the WFRC long range plan as included in the "end of phase II" model set. The extension of Legacy Parkway north of the project limits (from the northern terminus of the proposed Legacy Parkway at I-15 and US 89 to Gentile Street in Layton) is also included in the WFRC Long Range Plan, but was excluded from all model runs so as not to overstate the highway bottleneck in the north corridor by including an extension of a project still being evaluated.

As part of applying the travel demand forecasting process for the Legacy Parkway Supplemental EIS, the Legacy Parkway project developed a 2020 highway network, using the WFRC information and model to represent no-build conditions as well as to provide a background for evaluating the build alternatives. The "no-build" highway network was defined to include all of the projects included in Phase I (year 2012) and Phase II (year 2022) of the entire transportation system as described by the WFRC 2030 long range plan (adopted December 2003) with the exception of the Legacy Parkway between I-215 and US-89, the Legacy North project, and major improvements to I-15 between 600 North in Salt Lake City and 200 North In Kaysville. Most of the I-15 improvements in the south Davis County study area are actually included in Phase III of the WFRC 2030 long range plan, so this project was not removed to define the no-build as much as it was added to reflect several of the build alternatives, in order to remain consistent with the alternatives included in the Final EIS.

Phase I and Phase II of the WFRC long range plan include highway and transit projects projected to be financially feasible by the year 2022. The long range plan also includes a third phase of projects, which are projected to be financially feasible by the year 2030. In order for the Supplemental EIS to be consistent with the design year of the Final EIS, only the first two phases of the three-phase plan were included in the No-Build network to approximate the transportation system in the year 2020. Land use projections for the year 2020, as provided by the WFRC, were modeled on this base transportation system.

The most notable projects included in the no-build network are:

- Widening of Redwood Road from two to four lanes from 1000 North in Salt Lake City to 500 South in Woods Cross, which WFRC plans between 2013 and 2022.
- Widening of 500 South in Woods Cross to four lanes from I-15 to Legacy Parkway by 2012.
- Widening of Parrish Lane in Centerville to four lanes from I-15 to Legacy Parkway by 2012.
- Construction of Mountain View Corridor from I-80 to 13400 South in Riverton Jordan, which WFRC plans in varying stages beginning with SR-201 to 6200 South prior to 2012, 6200 South to 13400 South prior to the year 2022.

A capacity enhancement project was completed in October 2004 on I-15 between Beck Street and I-215. This project entailed construction of a short segment of general purpose lanes to relieve a bottleneck in the highway system. This improvement project is also included in the no-build highway network.

As part of the modeling for the Legacy Parkway Supplemental EIS, the WFRC model was modified to reflect various alternative “build” possibilities. It should be noted that the model structure, including all of the mathematical coding which is part of the WFRC regional travel model, remained unchanged for the Legacy Parkway analysis as compared to the WFRC long range plan. Changes to the model were limited to the inputs, which define the level and type of transportation infrastructure in the year 2020.

For the Legacy Parkway Supplemental EIS modeling, which included “I-15 build” alternatives, I-15 was coded as four general-purpose lanes plus an HOV lane in each direction. The HOV lane was included in the distribution and assignment portions of the analysis. Various other projects were also analyzed as alternatives to Legacy Parkway. The most notable newly evaluated highway alternative included what was termed a “Redwood Road Arterial.” The Redwood Road Arterial Alternative assumed four lanes in each direction on Redwood Road in its existing alignment (and then extending north to the I-15/US-89 interchange). Speeds and capacities for Redwood Road assumed a limited access, at-grade, signalized facility similar in operational characteristics to Bangerter Highway. The Redwood Road Arterial Alternative modeled for the Legacy Parkway Supplemental EIS included a capacity of 797 cars per lane per hour (with four lanes in each direction) and a coded free flow speed of 47.4 miles per hour from I-215 to Parrish Lane and 51.4 miles per hour from Parrish Lane to US-89. Roadway link speeds and capacities are inputs to the regional travel demand model. Since these inputs often require estimates of future conditions that do not have corresponding data, the WFRC employs a process of assigning speeds and capacities based on functional classification, area type, and a more subjective variable based on the degree of access control. For the Redwood Road Arterial Alternative, model inputs were patterned after Bangerter Highway.

Table B-2 provides a brief description of the components of each alternative analyzed as part of the Supplemental EIS. Alternative names included in the table are provided as a convenience of the modelers and are not intended to over-simplify or otherwise alter the value of each alternative. Specific model coding assumptions as well as further descriptions of specific alternatives are discussed elsewhere in this appendix.

Table B-2 Modeled Alternative Summary

Alternative	I-15 Configuration	Legacy Parkway	Transit	Arterial Street Plans	Demand Year
Existing 2001	Highway and transit networks as they existed in 2001 as per the calibrated WFRC model				2001
Shared Solution	8 Lanes + 2 HOV	4 Lanes	Maximum Future	WFRC Long Range Plan[1]	2020
No-Build	8 Lanes	Not Built	WFRC Long Range Plan	WFRC Long Range Plan[1]	2020
Redwood Road Arterial Alternative w/out I-15	8 Lanes	Not Built	Maximum Future	WFRC Long Range Plan plus Eight-Lane Redwood w/ Access Control[1]	2020
Maximum Future Transit w/out I-15	8 Lanes	Not Built	Maximum Future	WFRC Long Range Plan[1]	2020
Maximum Future Transit	8 Lanes + 2 HOV	Not Built	Maximum Future	WFRC Long Range Plan[1]	2020
Redwood Road Arterial Alternative	8 Lanes + 2 HOV	Not Built	Maximum Future	WFRC Long Range Plan plus Eight-Lane Redwood w/ Access Control[1]	2020
I-15 Improvements Beyond Ten Lanes	10 Lanes + 2 HOV	Not Built	Maximum Future	WFRC Long Range Plan[1]	2020

[1] WFRC long range plan used for the modeling was modified based on changes described in the text above.

Detailed modeling results of each alternative in Table B-2 are not always presented in this appendix in order to simplify the results for the reader. For example, the results of the Redwood Road Arterial and Maximum Future Transit Alternatives without I-15 improvements generally do not result in improvements in any performance measure evaluated over their respective comparisons with I-15 improvements included. Therefore, this appendix provides a comprehensive description of the travel modeling and modeling results, but does not comprehensively present the results of all alternatives not carried forward past the alternative screening.

In addition to the alternatives described above, analyses have been performed for several alternatives proposed in comments received on the Draft Supplemental EIS by Utahns for Better Transportation (UBET). These analyses are presented in a technical memorandum *Evaluation of UBET Proposals for North Corridor Transportation and Land Use* (Fehr & Peers 2005). Methods and findings from that report are summarized in Section B.5 of this appendix, and hereby incorporated by reference.

B.3.2.2 Transit Network Assumptions

The existing transit network was coded into the WFRC model to reflect current UTA operating plans. The future transit network as planned by WFRC is also represented in the WFRC model to reflect programmed transit projects as well as other transit projects included in the WFRC long range plan. The networks used in the Supplemental EIS analysis represent the highway and transit systems at the end of Phase 2 of the current WFRC long range plan. Projected completion date for Phase 2 projects is 2022. As the WFRC population and estimates represent 2020 projections, the Supplemental EIS analysis is termed a 2020 case, although travel conditions would be marginally worse in 2020 than predicted herein if key transportation network projects are delayed until 2022.

Below are listed the most notable transit projects included in the WFRC 2020 transit networks (the same for the build alternatives and the No-Build Alternative).

- Commuter rail operation from Salt Lake City to Ogden along the Union Pacific right-of-way, west of I-15.
- Increased express bus and local bus service on existing routes.
- Increased transit coverage by the extension of existing routes and addition of new routes.
- Provision of feeder bus service to commuter rail stations in Salt Lake, Davis, and Weber Counties.
- Several new light rail lines in Salt Lake County, including:
  - Mid-Jordan light rail serving Midvale and West Jordan.
  - Extension of the north-south TRAX line into Draper.
  - Airport light rail.
  - Light rail line into West Valley connecting east-west into the Sugar House area of Salt Lake City.
- Several new bus rapid transit lines, including:
  - North-south line connecting Davis County to the Salt Lake City central business district (CBD).
  - Additional bus rapid transit serving the proposed Mountain View Corridor, Redwood Road, and Salt Lake County, and 1300 East in Salt Lake County.

A “maximum future transit” analysis was coded for the Legacy Parkway modeling to reflect the more aggressive set of transit assumptions for the integration of mass transit with Legacy Parkway. The following bullets briefly define “maximum future transit” for the purpose of performing the Legacy Parkway travel modeling under the WFRC travel model (version 3.2) (February 2004).

- Transit routes estimated to be affordable by the year 2030 in the WFRC long range plan were assumed to be in place by the year 2020 (all transit *.LIN files based on “End of Phase 3” of the WFRC long range plan).
- No changes to walk access from WFRC Code.
- Double parking costs of all zones from WFRC Code ($0 parking remains $0).

- No premium transit fares (all express and rail mode fares equal to local bus, in contrast to WFRC Code).

- Commuter rail set to 15-minute headway north of Salt Lake City during rush hours (approximately 6-9 AM and 4-7 PM) in contrast to WFRC 20 minute-headway during rush hours.

- South Davis BRT time factor set to 0.8 (from 1.0) but otherwise as coded (mode 7) reflective of a higher speed bus system with travel times that are 80 percent of travel time of a "typical" bus line.

- Maximum wait time equal to 1 minute at the following additional nodes (2070, 3404, 3415, 3440, 3463, 3470, 3473, 3548, 3646, 3739, 5506, 5516, 5640, 12631, 12633, 12636, 12637, 12642, 12652, 12661, 12707) to reflect a seamless transfer service for transit routes, in contrast to WFRC coding, which assumes transfers occur between two uncoordinated services, but does include a maximum wait time of 10 minutes (or one half of the headway).

- Post model adjustments to account for the effects of transit-oriented development ("3/4 D" land use) around transit stations as defined by the Integration Analysis (Fehr & Peers 2004), since the WFRC model does not account for transit oriented development at the sub-traffic analysis zone level.

- Peak hour, peak direction transit riders calculated as a fraction of daily riders as defined by the integration analysis (Fehr & Peers 2004).

- No other changes to WFRC travel demand model (version 3.2).

Wasatch Front Regional Council is presently completing a transit needs analysis study for south Davis County, with the final report expected to be complete by the end of 2005 (Wasatch Front Regional Council in preparation). The draft study considers an alternative that includes bus rapid transit (BRT) along the US-89/Main Street/200 West alignment, at least up to Pages Lane in Centerville. Year 2030 ridership is anticipated to be around 7,000 to 8,000 passengers per day. These results are roughly consistent with a portion of the definition of maximum future transit for the Legacy Parkway Supplemental EIS. The BRT alignment recommended in the South Davis study is the same as the BRT alignment defined in the Supplemental EIS integration analysis between the start of the line in the Salt Lake City CBD and Pages Lane. The alignments deviate slightly from Pages Lane through Centerville, but re-join at State and Main Streets in Farmington, and continue together through Farmington to the Commuter Rail station. The ridership forecasts are also in general agreement. The South Davis BRT route ridership estimate of 7000 to 8000 riders in 2030 includes riders whose trips both board and alight without traveling across the Woods Cross screenline. The total number of BRT trips crossing the screenline in 2030 is projected to be about 4500 daily. When expressed as 2020 peak hour or peak period northbound ridership, the South Davis Study total screenline BRT ridership is similar to the Legacy Parkway integration analysis BRT estimate, and total transit ridership in the South Davis County Study is somewhat lower than the fully integrated maximum future transit system included in the Supplemental EIS.

Compared with the transit ridership forecasts prepared for the commuter rail final EIS (Federal Transit Administration and Utah Transit Authority 2005), the fully enhanced and integrated maximum future transit system, including higher frequencies and lower fares on commuter rail, generates higher ridership in comparable service years.

B.3.3 Trip Generation

Trip generation within the WFRC model estimates the number of person-trips, produced in and attracted to each zone based on the socioeconomic data characteristics and household characteristics (number of persons and automobile ownership) of that zone. Person-trips are estimated for internal-to-internal zones, internal-to-external, and external-to-internal zones. Eight trip purposes are defined in the trip generation module:

- Home-based work
- Home-based other
- Home-based school
- Home-based shopping
- Home-based personal business
- Non-home-based, work-related
- Non-home-based, non-work-related
- Commercial

Modeling for the Legacy Parkway Supplemental EIS did not change the trip generation process of the WFRC (and MAG) model as described in this section. Reference to base year calibration results generally refers to calibration efforts from WFRC on a regional basis, unless otherwise noted. Base year model calibration was generally performed for either a 2001 or a 2002 base year due to the lag of available socioeconomic data and highway network traffic counts.

B.3.3.1 Socioeconomic Data

The 2000 Census was used by WFRC to classify households by size (people in the household), income quartile, and workers per household. Census curves are fitted to basic zonal information such as the total households, average household size, and average zonal income, to determine the total number of households in combinations of these categories: 6 HH size categories (1 person to 6+ person), 4 worker categories (0 to 3+), and 4 income quartile categories. This then becomes basic input to Auto Ownership, Trip Generation, and Mode Choice modules of the WFRC model.

B.3.3.2 Person-Trips

The WFRC trip generation module estimates person-trips (productions and attractions) by trip purposes. Trip productions are estimated using a cross-classification household trip rate matrix based on information collected during the most recent home interview survey. Households are classified by the six household size categories and by car ownership. Four car ownership categories (0-car, 1-car, 2-car, and 3-or-more-car households) have been defined. WFRC estimated the trip rates for each class of households using information derived from the 1993 Home Interview Survey responses.

A "home interview" travel survey is relatively common practice in the travel demand modeling industry. Experience gained within the industry allows for a statistical sampling of households as opposed to extensive in-home interviews. The 1993 Home Interview Survey, performed by WFRC relied on advanced practice sampling techniques and activity based travel responses, which were coordinated with FHWA. The 1993 travel survey was an update of 30-year old survey data collected in the 1960s.

Despite statistical sampling techniques, travel surveys remain expensive undertakings and are not generally performed at frequencies sooner than every 10 years. The goal of travel surveys is to define travel attributes to specific demographic characteristics. For example, the number of trips generated by larger households with more vehicles as compared to smaller households with fewer vehicles is quantified by the survey. The actual numbers of households that fall into each socioeconomic variable classification can then be updated based on more recent data and forecasts of WFRC. Therefore, the trip rates of households of the same characteristics do not change, but the changing socioeconomic characteristics of households within the four-county region will indicate changes in travel. The survey techniques and application to the travel model were successfully reviewed as part of the 1999 Peer Review of the WFRC travel model developed as part of the MPO Certification Process of the WFRC performed by FHWA/FTA as well as a more recent (2002) in-house Peer Review performed by WFRC (Wasatch Front Regional Council 2002a). Peer Review attendees and summary findings are available from WFRC summarizing the 1999 FHWA Peer Review and the 2002 In-House Peer Review.

Trip attraction is a regression analysis that uses zonal trip attraction and socioeconomic data. A regression analysis is performed for each of the eight trip purposes considering the following variables:

- Population
- Total (occupied) dwelling units
- Single-family (occupied) dwelling units
- Multifamily (occupied) dwelling units
- Total employment
- Retail employment
- Industrial employment
- Other employment

Following the estimation of person-trips, internal-to-external/external-to-internal (IX-XI) vehicle trips are calculated. These are trips that have one end (origin or destination) in a TAZ within the four-county model area, and the other end outside the (four-county) model area, as represented by the cordon stations. IX-XI trips are estimated by WFRC based on zonal factors developed from the *1993 Home Interview Survey* responses and the estimated total internal trips in each zone. External-to-internal trips are estimated to be attracted to each TAZ in the region by total TAZ employment, and distributed by travel time from the external stations. Since survey methods employed by WFRC to estimate travel demand did not directly survey trips that were based outside of the four-county region, external-to-internal productions are estimated by WFRC to match available survey data by factoring IX trips included in the home based survey and matching the total external station counts provided by the Utah Department of Transportation (UDOT).

B.3.3.3 Special Generators

Certain TAZs require special trip generation techniques because the intensity of activity is not accurately modeled with basic trip generation methods or with survey methods that determine trip making at the home-based level. These "special generator" TAZs are facilities such as large business parks, Hill Air Force Base, regional shopping malls, high-density urban zones such as the CBD and sports complexes. WFRC performs the calculations for all special generators and no additional analysis or adjustment of special generators was performed for the Legacy Parkway Supplemental EIS modeling. Special generators affecting the study area include the Salt Lake City CBD, Hill Air Force Base, Lagoon Amusement park, and the Salt Lake International Airport.

B.3.3.4 Trips External to the Region

External-external trips are those trips with both ends outside of the four-county region. External-to-external trips are accounted for in the WFRC model via a fixed origin-destination vehicle trip matrix. Growth of the external trip matrix was made by the WFRC and not modified for the purpose of the project-specific analysis of the proposed action. The WFRC considers historic growth trends based on UDOT traffic counts at these external stations when estimating the future growth at each station. Since the former models for the Salt Lake Urban Area, Ogden Urban Area, and Provo-Orem Urban Area were combined into the present modeling domain in 1999, external stations have represented a small fraction of total trips. The external station forecasts of the WFRC model were not altered for use on the Legacy Parkway project. For the model calibration year, 2001, the number of external-to-external trips crossing an external station plus the number of internal-to-external plus external-to-internal trips crossing the same station equals the average annual weekday volume crossing that station in 2001. Year 2002 data was also reviewed by WFRC to incorporate changes from 2001 data to 2002. Because of the I-15 reconstruction project in Salt Lake, the model calibration was performed in 2001 but model results were compared to both 2001 and 2002 traffic counts.

B.3.3.5 Unique Trip Tables

Some major generators in the region have a trip distribution pattern that the current WFRC gravity trip distribution model would not adequately determine on its own. Each major college, Salt Lake International Airport and the Lagoon amusement park are examples where special generator trip data were available and the gravity model distribution was adjusted by WFRC to use pre-determined trip distribution matrices. Each of these special generator land uses has fixed trip tables created by WFRC that describe the distribution of trips across the region for current and future years. The Legacy Parkway modeling utilized these unique trip tables.

B.3.4 Trip Distribution

B.3.4.1 Travel Time Impedance

Using the highway network, a matrix is created of the travel times from each TAZ to every other TAZ in the network. This is referred to as an impedance (or "skim") table, and is one of the key input elements to the trip distribution model. In the WFRC modeling process, this table is created and updated iteratively through the feedback loop in the model process. The initial skim tables are created based on the free-flow link speeds assumed in the network. This skim table represents the travel times between TAZs during assumed uncongested conditions. This skim table is then used as one of the bases for distributing trips between TAZs, and the modeling process continues through assignment.

Following the assignment of trips to the highway network, link travel speeds are recalculated to reflect the relationship between traffic volume along a network and the capacity of that network—in other words, congestion. Skim tables are then developed using this "loaded" network containing capacity-constrained travel speeds output from trip assignment. These skim tables, containing travel times between zones under capacity-constrained or congested conditions, are fed back into the trip distribution process as one of the bases for distributing home-based work trips between TAZs. Home-based-work trips are assigned by the WFRC model to reflect congested conditions in the AM peak period assignment. Other trip purposes are assigned in the WFRC modeling process by the capacity constrained conditions of the mid-day assignment, where congestion has less of an impact on travel distribution patterns. The assignment process does not change the total number of trips generated in each period, it only changes the facility that origin and destination pairs travel on due to congestion. Since there is feedback between the assignment and distribution process, assignment and the effects of congestion will also change how trip production and trip attractions are paired into trip origins and trip destinations.

This more realistically represents the conditions under which drivers (particularly commuters) make travel decisions. Because travel time (more than travel distance) is a key factor for a driver in determining the reasonableness of a trip, basing the estimate of travel time on congested conditions will more realistically represent the spatial distribution between the home end of the work trip and the work destination.

Terminal and intrazonal times are added to the travel time for each interchange prior to distribution. The terminal times are based primarily on the parking situation in the TAZ. Normally a one-minute terminal time is added at the origin and destination end of each travel time. For TAZs in the CBC or at other locations where the distance from parking to the ultimate destination is expected to be longer, additional time is added at the terminal end. Intrazonal times are derived from the area of the TAZ, assuming all traffic moves at 20 mph and that all traffic originates at a distance inside the TAZ boundary equal to ½ the square root of the TAZ's area.

Calibration efforts by WFRC beginning in the initial four-county regional model development in 1999 revealed that the region has four distinct geographic areas between which observed travel behavior patterns are different than predicted. For example, in attempting to reproduce observed volumes, the WFRC model initially predicted substantially more trips between Salt Lake County and Utah County than were observed. The model had no ability to account for perceived geographic barriers, or local preferences to live, work, and shop in the same county. WFRC adjusted the model to address this using a fixed "time penalty." This time penalty, as applied by WFRC, represents a relatively common model practice to account for certain social biases, such as different geographic versions of the Sunday newspaper, which are not described by other socioeconomic variables. WFRC calibrated the regional model using fixed time penalties to achieve calibration to the year 2002 external station counts. These travel time penalties, as calibrated by WFRC, were used in the Legacy Supplemental EIS modeling.

B.3.4.2 Trip Distribution Analysis

The WFRC model performs trip distribution using a gravity methodology. The original eight trip purposes are collapsed into five trip purposes in distribution. Home based other trip distribution includes the home based school, home based shopping, and home based personal business trips. Non-home based trips include all non-home based work related and non-home based non-work related trips. Internal-external and external-internal trips are also distributed separately since part of their trip length is not captured in the regional model domain. These changes from trip purposes generated to the trip purposes distributed are based on available data and accepted modeling practice in the WFRC model. Separate trip distribution is performed for each of the five trip types.

- Home-based work
- Home-based other
- Non-home-based
- Internal-external/external-internal
- Commercial trips

The impedance matrices developed based on highway travel times are input to the trip distribution process. For home-based work trips, travel time impedances are based on assumed congested speeds in the AM peak period. For other trip purposes, the travel times are based on less congested conditions of the mid-day period, outside of either the AM or the PM peak. This is equivalent to saying that people choose the location of work based on a consideration of traffic congestion in the morning peak, but people choose the location of shopping, schools, and all other destinations based on uncongested conditions. In reality, these decisions may be much more complex, but the travel model is not locating jobs and schools and land uses, only matching up trips of previously estimated destinations. Home-based college trips are also deducted from the aggregate totals of home-based “other” trips based on student enrollment data collected by WFRC for each college and university. Home-based college trips are distributed based on a pre-established distribution created by WFRC to match base year enrollment distribution by zip code.

Friction factors define people’s propensity to make a trip based on the purpose of the trip and the length of the trip, as defined by travel time. The friction factors used in the WFRC travel demand models were developed and were calibrated by comparing (for each trip purpose) observed trip length frequency distributions obtained through responses to the 1993 Home Interview Survey to those estimated by the model. Work is presently underway by WFRC to review the reasonableness of trip length frequencies derived from highway travel times to account for transit trips, as derived from more recent transit on-board surveys. While there is no timeline for the completion of this work, other model checks and calibration performed by WFRC, such as aggregate work trip analysis resulting from the 2000 Census results, confirm that the trip length frequencies from the 1993 Survey along with screenline adjustments of the fixed time penalty, produce adequate model results of base year (2001 and 2002) conditions.

B.3.4.3 Average Trip Lengths

Table B-3 (Average Trip Length) summarizes the average trip lengths of the WFRC model as run for the Legacy Parkway analysis, by trip purpose, for the base year 2001 and forecast years 2020 no-build conditions and the 2020 build alternatives. The average trip lengths are presented in minutes, actually representing the average duration of a trip, across the entire system (daily traffic volumes at the Woods Cross screenline are presented in Table B-5 below.). Results are presented for both Davis County (including north Davis County) and the entire four-county region as included in the WFRC model. As is typically the case, people are willing, on average, to travel further to work than they are willing to travel for non-work-related trips such as shopping or personal business. The similarities between average trip lengths for each purpose when comparing year 2001 data to year 2020 scenarios indicates that the trip distribution model is able to create future year origin-destination trip matrices that are able to replicate base-year observed trip length frequency distributions.

Table B-3 Average Trip Length (Minutes)

Type of Trip	2001		No-Build		Shared Solution	
	Davis Co.	Region	Davis Co.	Region	Davis Co.	Region
HBW (Home-Based Work)	19	18	22	21	20	20
HBC (Home-Based College)	27	15	29	17	27	17
HBO (Home-Based Other)	10	11	11	12	11	12
NHB (Non-Home-Based)	12	13	14	14	14	14
IX (Internal-to-External)	27	24	28	25	28	25
XI (External-to-Internal)	25	37	27	34	27	34
COMM (Commercial)	9	10	10	11	10	11
XX (External-to-External)	N.A.	46	N.A.	46	N.A.	46

Note: Figures in the Final Supplemental EIS differ from the Draft Supplemental EIS slightly for the same alternative because more thorough modeling was conducted that used a single, consistent, and complete version of the WFRC travel model version 3.2 for all scenarios reported, included the allocation of transit-supportive land use for year 2020 scenarios, and rounded results to the nearest minute, rather than second.

Model Version 3.2 (Fehr & Peers 2005).

The current 2004 WFRC travel model (version 3.2) includes feedback loops that inform trip distribution of congested highway travel times resulting from assignment. As highway travel times increase due to congestion, trip distribution matches production TAZs to attraction TAZs that are closer together to maintain a reasonable pattern of trip lengths. This mechanism, along with mode choice, results in a varying total number of trips across any location, such as the Woods Cross screenline, that displays congestion.

This concept of varying distribution based on the feedback of traffic congestion resulting from the assignment step into the distribution step is one of the major improvements made by the WFRC to the travel model in recent years. Feedback from assignment to distribution was introduced into the WFRC model prior to the release of the Legacy Parkway Final EIS, but was not used in the Draft EIS. This is the reason that traffic volumes at the Woods Cross screenline were identical for all model alternatives in the Final EIS since no model feedback existed during the initial analysis. The concept of “unmet demand” was estimated from the model results, after the completion of the modeling, to estimate the number of passenger car equivalent trips that exceeded a level of service (LOS) D. Under the current WFRC model (version 3.2) as used in the Legacy Parkway Supplemental EIS, the number of passenger car equivalent trips across the Woods Cross screenline varies based on the congestion level of each alternative highway and transit network.

The feedback process used in the Legacy Parkway Supplemental EIS allows for speeds to become slower based on the effects of congestion which results in a different matching of origin and destination pairs which essentially removes trips from the Woods Cross screenline as congestion increases, but still matches those trip pairs to other (less congested) locations in the four county regional model. Although congestion begins at LOS D and becomes increasingly greater at worsening levels of service, the WFRC model does not prohibit trip pairs across the Woods Cross screenline based on congestion; it simply allows for the affects of congestion to alter the location and mode of a fixed number of trips (estimated in the WFRC model trip generation step).

Because the current WFRC model alters location and mode of trips in response to congestion, the Supplemental EIS no longer uses the concept of “unmet demand” which was used in the Final EIS. The concept of “unmet demand” was used in the Final EIS to compare projected travel demand against the capacity of future transportation systems. Changes in the WFRC model now vary total demand in direct response to the capacities of the transportation system, making the concept of “unmet demand” less useful for the Supplemental EIS.

B.3.4.4 Unmet and Induced Demand

The Final EIS used the concepts of “unmet demand” and “latent demand” to describe the effects of traffic capacity and congestion on travel demand. Changes in the WFRC model make using the “unmet demand” concept less useful for the Supplemental EIS for three reasons. First, the overall level of 2020 travel demand in the corridor is lower than in the Final EIS due to updates to the WFRC socioeconomic forecasts and other model calculations. Second, the current WFRC model varies total demand depending upon the capacities of the transportation system, and alters location and mode of trips in response to congestion. As a result, the model better reflects typical traveler behavior and allows trips to be redistributed to other destinations or modes of travel rather than defining the demand as unmet. Third, the analysis now recognizes demand in excess of capacity in terms of worsening degrees of LOS F congestion and further reduced traffic speeds and associated impacts, rather than simply in terms of unmet demand. Consequently, the Supplemental EIS no longer uses the concept of “unmet demand” used in the Final EIS.

The varying of total demand is accounted for in both the distribution step and the mode choice step of the WFRC model. Increases in demand in response to decreasing congestion is described in terms of “induced demand.” As transportation service levels decline, the propensity to travel also reduces; trips become shorter or redirected, rely on alternate modes, or occur at less convenient times of day. As transportation system capacity is improved, some trips will be induced in response to the enhanced capacity. These trips can be viewed as induced demand, reflecting trips that the traveling public finds attractive because the capacity has been enhanced.

The build alternatives would increase roadway capacity and reduce travel times in the north corridor. The reduction in travel time is analogous to a reduction in travel cost. In measuring this change, the most significant effect would be a potential shift in travel routes for some drivers and a potential shift in mode choice. Other travel demand effects such as increased trip generation or time of day shifts (including peak spreading), due to capacity increases do not have as significant effects for analyzing the Shared Solution. The WFRC model captures induced demand and incorporates it as a part of total projected demand.

Given the use of consistent land use assumptions in the analysis of all of the alternatives, the main variations in corridor travel demand from one alternative to the next relate to the different levels of accessibility and travel ease offered by the respective alternatives. The WFRC model was tested specifically for its sensitivity to these types of changes. In November 2003, UDOT completed an analysis of the elasticity of demand estimated with the WFRC travel models (version 2.1) to changes in capacity. These changes occur due to trip distribution, mode choice, and trip assignment steps of the model. According to UDOT’s sensitivity analysis (Cambridge Systematics, November 2003, WFRC Model Sensitivity Study):

> Model elasticities fall within the expected range of acceptability based on comparisons with elasticity cited in a variety of research papers…Vehicle miles traveled generally increase with the addition of specific roadway projects while vehicle hours generally decreased.

Figure B-1 displays the changes in the Woods Cross screenline volume with various alternatives to Legacy Parkway evaluated in the Supplemental EIS in the PM peak period. The use of the Woods Cross screenline and the use of the PM peak period are explained in Chapter 1 of this document. As shown, total screenline demand increases relative to increases in screenline capacity, from about 49,400 under the No-Build to about 49,700 with the Shared Solution. The route and mode shifts associated with induced travel from Legacy Parkway are measurable, although generally less than 1 percent of total screenline volume, and are accounted for in the WFRC travel model.

B.3.5 Mode Choice

B.3.5.1 Method of Mode Choice Analysis

Transit ridership forecasting methodologies used to prepare the Legacy Parkway Supplemental EIS differ from those used in the preparation of the Legacy Parkway Final EIS. While the WFRC model used for the Final EIS had a mode choice component, output from that model was only one factor used in developing the mode specific traffic volume forecasts presented in the Final EIS. A specific set of transit improvements was not specified in the Final EIS. More significantly, the concept of an extraordinary transit system was estimated based on an aggressive projection developed with UTA. In total, four methods were actually examined in the Final EIS including the use of the WFRC mode choice travel model, extraordinary transit concept, and experience in other areas. The Final EIS selected the highest transit capacity of the four methods and reported the results, not as a prediction of future transit ridership, but rather as a maximum level of transit ridership that could occur given the financial and other assumptions in the plan.

The recommendation of the lead federal agencies in the Legacy Parkway Supplemental EIS was to estimate transit ridership based on the mode split step of the regional travel demand model. Therefore, while the Final EIS included transit capacity as the maximum reduction of highway use that could be accommodated by the transit system, the Supplemental EIS uses the mode choice model to estimate demand of transit use. The modeling for the Supplemental EIS continued to use the WFRC mode choice step of the WFRC model, but with coding changes, as described in the Section B3.2.2 *Transit Network Assumption*, to account for a more “robust” level of transit supply.

B.3.5.2 Available Modes

Modal choice is the third step of the four-step travel demand modeling process. Productions and attractions of the trip generation module are linked in trip distribution, creating zone-to-zone person trip movements. These trips are then apportioned to the available travel modes through the application of the mode choice module.

The current WFRC mode choice module is calibrated to local data gathered for all modes that currently exist along the Wasatch Front as part of an on-board survey of transit riders conducted by UTA in 2002. The travel market that has mode choices available is segmented into four trip purposes; home-based work (HBW), home-based college (HBC), home-based other (HBO) and non-home-based (NHB). The trip purposes included in the mode choice analysis vary from the original trip generation and trip distribution purposes. Home-based college trips represent a sub-set of home-based other trips that have been found, through on-board surveys of the WFRC, to represent a reasonable portion of transit trips to estimate directly (as opposed to indirectly through home-based other trips). Commercial trips are generated as vehicle trips by definition, so no mode split component is necessary. Each trip purpose included in mode choice is also segmented in to three auto-ownership classes (zero-, one-, and two-car households) and two income classes (average/high and low) with the exception of non- home-based as by definition this purpose cannot be segmented by household data. As mentioned, HBC was subtracted from the HBO totals based on the data collected by each college and university. HBC is also a subset of Home-based school trips, which include high school and lower grades as originally reported in the 1993 Home Interview Survey.

An independent nested logit mode choice module exists for each trip purpose. These modules specifically address the following modes.

- Drive Alone: single-occupant auto trips.
- Shared Ride 2: double-occupancy auto trips.
- Shared Ride 3+: auto trips with three or more occupants.
- Transit - Walk to Local Bus.
- Transit - Walk to Express Bus.
- Transit - Walk to Light Rail.
- Transit - Walk to Commuter Rail.
- Transit - Drive to Local Bus.
- Transit - Drive to Express Bus.
- Transit - Drive to Light Rail.
- Transit - Drive to Commuter Rail.
- Walk trips.
- Bicycle trips.

Auto-occupancy for HBW, HBC, HBO and NHB trips is defined via mode choice before trips are assigned to the highway. This differs from the auto-occupancy methodology included in models used for the Legacy Parkway Final EIS. With the current model, trips are not assumed to occur in vehicles of fixed auto-occupancy, with a reduction to account for transit; rather all trips for HBW, HBC, HBO and NHB purposes choose (per the logit nesting structure) to make either a motorized or non-motorized trip. If the trip is motorized, it is either transit or auto-based. If an auto trip is chosen, it is either a single or multiple-occupant vehicle. If a multiple-occupant vehicle is chosen, it is either a two-person carpool, or a three- or more person carpool. Similar decision processes occur for the other modes. This description of the mode choice portion of the model applies to the modeling done for the Legacy Parkway Supplemental EIS, except in the coding of transit networks as described earlier in this memorandum.

B.3.6 Peak-Period Trip Tables

In the updated WFRC regional travel demand model, peak-period trip tables are developed by applying factors, by purpose, to the daily person-trip tables. For example, the number of AM peak-period, home-based work trips are estimated as:

[daily HBW trips$_{ZONE}$ i,j) X (AM peak factor$_{HBW-P}$)] + [daily HBW trips$_{ZONE}$ j,i) X (AM peak factor$_{HBW-A}$)]

The AM and PM peak periods within the model have a 3-hour duration. The 3-hour forecast can therefore include trips that would spread from the peak one hour into the preceding, or following, shoulder hour and be accounted for in the peak period projection. The AM and PM peak-period factors were developed based on the 1993 Home Interview Survey. Table B-4 (Peak-Period Factors) shows the factors applied to each trip purpose to create the morning (AM) peak period and evening (PM) peak-period person-trip tables. Peak period factors are developed statically in the WFRC model, which means they do not change from the existing year to the future, and represent peak period demand as captured in the revealed (1993) data. Trip tables developed by WFRC were unchanged for the Legacy Parkway Supplemental EIS alternatives analysis.

Table B-4 Peak-Period Factors

	AM Peak Period	PM Peak Period
HBW – P	0.70	0.04
HBW – A	0.06	0.52
HBC – P	0.70	0.04
HBC – A	0.06	0.52
HBO – P	0.28	0.20
HBO – A	0.04	0.32
NHB	0.06	0.26
IX	0.04	0.44
XI	0.50	0.12
COMM	0.06	0.26

HBW - P	=	Home-based work trips—productions (commuters leaving homes and traveling to work)
HBW - A	=	Home-based work trips—attractions (work opportunities that attract travel by people)
HBC - P	=	Home-based college trips—productions (students leaving homes and traveling to college)
HBC - A	=	Home-based college trips—attractions (classrooms that attract college students)
HBO - P	=	Home-based other trips—productions (people leaving homes and traveling to places other than work)
HBO - A	=	Home-based other trips—attractions (places other than work that attract travel by people)
NHB	=	Non-home-based trips
IX/XI	=	Internal-external/external-internal
COMM	=	Commercial

Source: WFRC Travel Demand Model, February 2004.

Note: The peak-period factors in the Final Supplemental EIS differ from those reported in the Draft Supplemental EIS because, although, the Draft Supplemental EIS analysis used these same factors, they were inadvertently incorrectly reported in the Draft Supplemental EIS.

B.3.7 Highway Assignment

The highway assignment in the WFRC travel demand process is performed using a capacity- restrained, equilibrium-assignment technique. Capacity restraint is a general expression about the process of using congestion, and its impacts on travel time, as a means of simulating driver behavior under real-life conditions. All person trips that choose to travel in single occupancy vehicles, 2 person carpool or 3-plus person carpool in mode choice are factored to reflect the number of vehicles those trips would be made in (i.e., two-person carpool person trips, divided by two equals the number of vehicle trips).

Internal-to-external, external-to-internal, external-to-external and commercial trips are calculated in vehicle trips throughout the modeling process. Non-motorized and transit trips resulting from mode choice are not assigned to the highway network. Bus routing, which is irrespective of mode choice results, generally has an insignificant impact on highway assignment (in the range of four vehicle trips per hour for a high frequency bus route). Initially, all vehicle trips are assigned to paths with minimum travel times, based on free-flow travel speeds. After all trips are assigned, the volume on each link is compared to its capacity and the travel time impedance is adjusted, based on the volume-to-capacity ratio on that link. The assignment process is repeated with the adjusted travel times. In an equilibrium assignment, this process is repeated iteratively until all trips are traveling along the optimum path, based on specified closure criteria.

The resulting output from the highway assignment process is a “loaded” highway network containing link volumes and travel speeds based on the volume-to-capacity ratio of the link. Statistics on vehicle miles of travel and vehicles hours of travel are also reported.

For each alternative analyzed, highway assignments are performed for:

- AM peak period
- Mid-day period
- PM peak period

- Evening period

The assignment periods included in the travel model include multi-hour periods representative of various levels of congestion throughout the day, but large enough to capture the effects of peak spreading that may occur in the future. Specifically, both the AM and PM peak periods represent 3 hour periods supported by data from the 1993 Home Interview Survey which reflects the highest level of trip making and the potentially greatest traffic congestion. The PM peak period, used in subsequent peak hour analysis, includes the peak hour and two “shoulder” hours just before and after the highest peak hour.

The traffic volume forecasts for each portion of the day are summed to provide daily traffic volumes on each segment of highway modeled. The data from the AM and PM peak periods were factored to provide AM peak hour and PM peak hour traffic volumes, respectively. This process was completed for each of the alternatives analyzed. The Legacy Parkway Supplemental EIS modeling used the WFRC assignment portion of the travel model, with only the adjustments discussed previously being made to highway network coding to reflect the alternative being analyzed. Actual link impedance functions were recently re-calibrated by WFRC staff based on on-going speed data collection activities and described in the *Wasatch Front Regional Council Speed Study*, completed December 18, 2003 as an internal report by the WFRC staff. Model version 3.2 used for this Supplemental EIS includes these recalibrated impedance functions. Impedance functions of the WFRC model are based on modifications of the original Bureau of Public Roads impedance functions as recommended in the *Highway Capacity Manual* (Transportation Research Board 2000) by functional road classification and as developed by WFRC to achieve base year (2001 and 2002) speed calibration.

B.3.7.1 Average Daily Traffic Volume Forecasts

The Legacy Parkway Final EIS analyzed average daily traffic volumes for the North Corridor on a “screenline” basis. A screenline is an imaginary line through a travel corridor that crosses all generally parallel highways and roadways that carry traffic through that corridor. The screenline used was between 2600 South and 500 South (in Woods Cross). This screenline location was selected for use in the Final EIS because it carried a substantial traffic volume, was central to the Legacy Parkway and I-15 North Corridor study areas, and was considered to indicate the share of traffic that is expected to be carried by each of the roadway facilities for each alternative.

The same approach was used for the Supplemental EIS. Table B-5 shows the average daily traffic volumes along the roadway segments within the screenline, and the total forecast volume across the screenline for the no-build and build Legacy Parkway alternatives as determined by current forecasting methods. Although only northbound volumes are reported, both northbound and southbound volumes are included in the total.

Table B-5 Traffic Volumes At Woods Cross Screenline (2020)—Average Daily

	No Build		Shared Solution	
South of 500 South:	Northbound	Total	Northbound	Total
Legacy Parkway	0	0	34,200	70,300
Redwood Road	8,900	17,000	6,700	12,100
1100 West	1,200	1,500	200	400
800 West	4,900	9,800	5,500	10,600
I-15	110,100	221,400	83,500	166,600
U.S. 89	11,700	25,200	10,300	20,600
500 West	2,100	2,900	500	1,100
Orchard Road	5,900	11,900	5,400	11,200
Davis Boulevard	3,800	7,400	3,700	7,200
Bountiful Blvd.	5,000	10,000	4,700	9,300
Screenline Total	153,600	307,100	154,700	309,400

Source: WFRC travel model ver. 3.2 (2004) as modified and run by Fehr & Peers. Model data traffic volumes represent number of vehicles not converted to passenger-car equivalents and are rounded to the nearest hundred.

Note: Figures in the Final Supplemental EIS differ from the Draft Supplemental EIS slightly for the same alternative because the traffic model was re-run for all scenarios (years 2001 and 2020) and alternatives to ensure a single, consistent, complete application of WFRC travel model version 3.2 for all scenarios reported in this Supplemental EIS.

B.3.7.2 Peak-Period Traffic Volumes

To estimate peak-period traffic in the region and within the North Corridor specifically, the peak- period trip tables were assigned to the highway networks for each alternative. The assignment process is consistent with the WFRC PM peak-period assignment, and was used as a basis for determining peak period demand in the Legacy Parkway Supplemental EIS. Analysis of peak- period conditions is important because peak-period travel tends to be more concentrated and, in most urbanized areas, has substantial directional imbalances (e.g., inbound traffic towards activity centers during the morning peak-period, and outbound, from activity centers towards residential areas, during the evening peak-period).

The peak-period assignments in the WFRC travel demand model represent 3-hour durations for the AM and PM peak periods. The screenline traffic volumes for these peak periods are shown in Table B-6a, Traffic Volumes at Screenlines (2020)—AM Peak-Period, and Table B-6b, Traffic Volumes at Screenlines (2020)—PM peak period.

B.3.7.3 Selection of the Woods Cross Screenline

The Woods Cross screenline was selected for analysis in the Final EIS. The use of this screenline in the Final EIS was developed after a thorough consideration of all sections of the corridor and based on traffic volumes on all facilities in the corridor. After consideration, Woods Cross was chosen as being a representative section where traffic volumes and subsequent demand were among the highest.

Table B-6a Traffic Volumes At Screenlines (2020)—AM Peak Period

	No-Build		Shared Solution	
South of 500 South:	Northbound	Southbound	Northbound	Southbound
Legacy Parkway	0	0	4,236	10,567
Redwood Road	1,204	2,629	1,064	888
1100 West	18	91	15	73
800 West	642	1,352	744	1,180
I-15	14,605	27,298	10,483	22,752
U.S. 89	1,581	4,820	1,662	1,849
500 West	89	317	87	62
Orchard Road	506	2,082	529	1,821
Davis Boulevard	431	709	429	699
Bountiful Boulevard	448	1,520	435	2,677
Screenline Total	19,524	40,818	19,684	43,812

Source: WFRC travel model ver. 3.2 (Feb. 2004) as modified and run by Fehr & Peers. Model data traffic volumes represent number of vehicles not converted to passenger-car equivalents and are shown in table.

Note: Figures in the Final Supplemental EIS differ from the Draft Supplemental EIS slightly for the same alternative because the traffic model was re-run for all scenarios (years 2001 and 2020) and alternatives to ensure a single, consistent, complete application of WFRC travel model version 3.2 for all scenarios reported in this Supplemental EIS.

Table B-6b Traffic Volumes At Screenlines (2020)—PM Peak Period

	No-Build		Shared Solution	
South of 500 South:	Northbound	Southbound	Northbound	Southbound
Legacy Parkway	0	0	10,824	7,789
Redwood Road	4,038	1,893	1,995	1,448
1100 West	968	162	124	106
800 West	1,627	1,128	1,674	1,229
I-15	29,881	23,598	26,567	16,862
U.S. 89	4,951	3,248	3,207	2,936
500 West	1,705	201	129	171
Orchard Road	2,519	1,267	1,830	1,357
Davis Boulevard	1,244	843	1,154	810
Bountiful Boulevard	1,950	1,062	1,735	942
Screenline Total	48,883	33,402	49,239	33,650

Source: WFRC travel model ver. 3.2 (Feb. 2004) as modified and run by Fehr & Peers. Model data traffic volumes represent number of vehicles not converted to passenger-car equivalents and are shown in table.

Note: Figures in the Final Supplemental EIS differ from the Draft Supplemental EIS slightly for the same alternative because the traffic model was re-run for all scenarios (years 2001 and 2020) and alternatives to ensure a single, consistent, complete application of WFRC travel model version 3.2 for all scenarios reported in this Supplemental EIS.

Selection of the Woods Cross screenline for the Supplemental EIS was chosen primarily for consistency with the Final EIS and because it is representative of the corridor. However, a comparison of volumes at the Woods Cross screenline was made against the Farmington screenline, also presented in the Final EIS, to determine that the Woods Cross screenline remained the point where the volumes were representative of conditions through the corridor. Table B-7 displays the total PM peak period traffic volume at both the Farmington screenline and Woods Cross screenline for existing (2001) conditions, the 2020 No Build, and the 2020 Shared Solution. All other alternatives fall within the range of the Shared Solution and No Build results.

Table B-7 PM Peak Period Highway Network Screenline Comparison

	Farmington Screenline		Woods Cross Screenline	
	Northbound	Total	Northbound	Total
Existing (2001)	25,421	40,476	34,919	56,809
No Build	38,619	62,700	48,883	82,285
Shared Solution	38,792	62,921	49,239	82,889

Source: WFRC model ver. 3.2 (Feb. 2004) as modified. Model data traffic volumes have not been adjusted.

Note: Figures in the Final Supplemental EIS differ from the Draft Supplemental EIS slightly for the same alternative because the traffic model was re-run for all scenarios (years 2001 and 2020) and alternatives to ensure a single, consistent, complete application of WFRC travel model version 3.2 for all scenarios reported in this Supplemental EIS.

B.3.8 Vehicle-Miles and Vehicle-Hours of Travel (VMT and VHT)

Vehicle miles of travel can also be displayed as a result of the modeling analysis. Table B-8 includes the regional vehicle miles of travel for the No-Build and Shared Solution. This table updates a similar table (P-11) included in the Final EIS. It indicates that, the Shared Solution increases mobility at both the regional and study area level. VMT increases under the Shared Solution on a daily basis for the AM and PM peak periods, indicating a very small (less than 0.5 percent) amount of induced travel or a reduction in unmet or suppressed demand. In spite of the increase in VMT, regional and corridor VHT decrease considerably, by 27 percent to 46 percent within the study area, and 2 percent to 4 percent across the entire region. Travel speeds in the corridor improve by 37 percent to 87 percent depending on the time of day, and average regional travel speeds increase by 2 percent to 5 percent. Combined, these factors indicate that the Shared Solution allows greater mobility at considerably reduced delay both locally and regionally.

Table B-8 Regional and Study Area Vehicle-Miles of Travel (VMT) and Vehicle-Hours of Travel (VHT) for 2020

	Regional	Study Area

Period	No-Build	Shared Solution	No-Build	Shared Solution
Daily				
VMT	62,277,511	62,322,666	3,761,613	3,778,607
VHT	1,778,599	1,741,908	107,591	78,489
Speed (mph)	35.0	35.8	35.0	48.1
AM Peak Period				
VMT	11,791,018	11,798,305	735,675	736,816
VHT	329,522	318,464	23,899	14,904
Speed (mph)	35.8	37.0	30.8	49.4
PM Peak Period				
VMT	16,765,131	16,782,780	1,007,996	1,009,956
VHT	579,235	554,773	41,230	22,126
Speed (mph)	28.9	30.3	24.4	45.6

Notes:

WFRC Model (version 3.2) (Feb. 2004) as modified and run by Fehr & Peers.

Regional totals included the four-county area (Salt Lake, Utah, Davis, and Weber Counties) included in the model, study area covers TAZ 2002 300–350 inclusive; includes centroid connectors.

Figures in the Final Supplemental EIS differ from the Draft Supplemental EIS slightly for the same alternative because the traffic model was re-run for all scenarios (years 2001 and 2020) and alternatives to ensure a single, consistent, complete application of WFRC travel model version 3.2 for all scenarios reported in this Supplemental EIS.

B.4 Post-Model Adjustments

Processing of model outputs are more commonly referred to as "post model adjustments." Post model adjustments can be undertaken to "correct" model results, such as in the case of travel demand behavior that is not adequately addressed by the modeling process, or to allow the model outputs to be in consistent units necessary for capacity analysis. For the purpose of this section, any processing of model results that resulted in numbers that are not directly found as an output of the WFRC travel demand model, including model outputs resulting from the Legacy Parkway Supplemental EIS application of the WFRC travel demand model, as described, shall be termed a "post model adjustment." The Legacy Parkway Supplemental EIS modeling process employed both types of post model adjustments.

B4.1 Traffic Capacity Analysis

Traffic capacity affects travel demand forecasting in the manner described above in Section B.3.4.4, *Induced Demand*. In addition, traffic capacity analysis is used to determine the ability of the street and highway system to carry the projected traffic demand at acceptable levels of service (LOS). LOS is determined by comparing the volume of traffic using a street or highway segment during a period of time (such as PM peak period) with the capacity of the segment. For purposes of 30-year corridor-level LOS forecasting, generalized or aggregate data are used for street and highway capacities and for estimated traffic volumes. For other purposes, such as to refine specific localized design decisions, more detailed analysis of traffic conditions, including simulation of traffic behavior and the dynamic attributes of capacity, is sometimes used.

The Highway Capacity Manual (HCM) published by the Transportation Research Board provides a standard means of estimating the performance of traffic facilities based on traffic data, such as traffic counts and design geometries, as well as forecast information, such as future traffic growth and facility improvements. At the national level, much research is being applied to attempting to merge regional macroeconomic travel demand models, such at those employed by WFRC, with micro-simulation analysis, but no metropolitan areas presently use a single model for demand forecasting and micro-scale traffic capacity analysis. Therefore, the HCM is used in this Supplemental EIS as the basis of capacity and LOS analysis.

B.4.2 Model Adjustments

The Legacy Parkway Final EIS included an adjustment of demand to account for Transportation Systems Management, Transportation Demand Management, and Intelligent Transportation Systems (TSM/TDM/ITS) as an after model analysis. A review of the adequacy of the model to capture and include relevant components of TSM/TDM/ITS for the Supplemental EIS was conducted as part of the analysis prepared for the Integration Technical Memo. As a result, primary elements of TSM/TDM/ITS are included in the current analysis through their inclusion in the new versions of WFRC travel demand model, or through in-model assumptions or post-model adjustments to capture the effects of the maximum future transit alternative developed for the Legacy Parkway Supplemental EIS. Several ITS and TSM measures are not included quantitatively in the analysis because they are primarily effective during traffic incidents rather than under the average weekday PM peak period conditions addressed in the Supplemental EIS capacity and LOS analysis.

Table B-9 displays various TSM, TDM, and ITS components and identifies the manner in which they were addressed in the Legacy Parkway Supplemental EIS analysis, indicating those included in the travel model application, post model adjustments, or non-quantitative assessment of incident scenarios.

TSM is the acronym for Transportation Systems Management and generally refers to highway infrastructure optimization activities that do not require significant new infrastructure. Examples include ramp metering and reversible lanes. Since Legacy Parkway represents a new construction and I-15 is proposed to be reconstructed, the primary capacity enhancements associated with these facilities have been coded into the WFRC travel demand model by WFRC. The Supplemental EIS post-model analysis further refined the capacity analysis to incorporate relevant optimization associated with TSM operational improvements.

TDM is the acronym for travel demand management and includes a wide range of driver behavior related to avoiding peak travel periods or changing modes. Examples include parking pricing, carpool promotion and flex-time work hours. Most TDM elements are now incorporated in the utility functions of the WFRC mode choice model or captured in the calibration of the mode choice model to existing behavior. For example, the models reflect traveler response to parking prices and employer adoption and employee participation levels in telecommuting and variable work hours. The model extrapolates current trends associated with these factors into the future, allowing that any higher levels of adoption at large employers would be off-set by the overall trend towards smaller, more dispersed employment centers. ITS is the acronym for Intelligent Transportation Systems and includes a host of advancing technologies related to “smart cars” and “smart systems.” While it is difficult to predict future technologies, the primary focus of these technologies has been to provide better real time information to motorists in order to reduce the impacts of incidents and better utilize the available capacity. These applications are especially effective when capacity-reducing incidents occur, and when reasonable alternate travel routes are available. The quantitative capacity and Level of Service analysis performed for this Supplemental EIS addresses peak period conditions on a typical 2020 weekday, not conditions during major incidents. Although not specifically addressed in the traffic modeling, the benefits of information-based ITS elements are addressed through discussion of incident management issues in the corridor.

Because regional travel models such as the WFRC model do not focus in detail on neighborhood conditions, post-model adjustments are used to capture the TDM effects of land use clustering around transit stations, and localized density and land use mixing and associated with transit-oriented development (TOD). Therefore, the analysis of maximum future transit in the Supplemental EIS Integration analysis used post-model adjustments to increase transit, walk and bike shares and reduce automobile passenger car equivalents in the roadway capacity and LOS analysis. This accounted for sub-traffic zone level changes in land use to reflect TOD. For comparability, the increase in transit ridership was converted to transit "passenger car equivalents", a calculated number of passenger cars that would otherwise be occupied by a number of transit riders.

B.4.3 Model Adjustment for HCM Analysis

Various model adjustments were performed to allow the volume results reported in the travel model to be directly compared with methods included in the *Highway Capacity Manual*. These necessary adjustments include the following:

- Conversion of the 3-hour peak period to a peak hour,
- Heavy vehicle factor adjustments, and
- Peak-hour factor adjustments.

Each of the adjustments made were discussed amongst the Integration Analysis Technical Group upon review of data gathered locally, and are described in more detail below. The Integration Analysis Technical Group included representation from FHWA, the Corps, UDOT, UTA, WFRC, and the consultant team.

B.4.3.1 Peak Spreading

The WFRC model directly estimates traffic during the full 3-hour commute period, approximately 3:30 to 6:30 PM. The Final EIS estimated traffic during the single highest hour within the period using 34 percent of the peak 3-hour volume. For the Supplemental EIS, a review of recent traffic counts (Fehr & Peers 2004) indicates that peak hour traffic equals about 36 percent of the peak period demand. Discussions with WFRC model developers indicate that a 36 percent peak hour conversion from peak period is now common throughout the model area. Note that these are different conversions than those related to the peak period factors shown in Table B-4. The Table B-4 factors do not apply to peak-hour conditions, but instead are used to relate the peak period traffic to daily traffic for individual trip purposes.

As requested during Supplemental EIS scoping meetings, the Supplemental EIS capacity analysis is based not on the single highest peak hour of the day, but on the average peak period conditions. This approach identifies the street and highway capacity needed to satisfy 33.3 percent of the 3-hour peak period demand, rather than the 36 percent represented by the single highest peak hour. As a result, capacity needs identified in the Supplemental EIS are lower by a factor of 33.3/36.0 than would be the case if they were based on the single peak hour. The intent of the direction received during scoping was to assure that the Supplemental EIS addressed the phenomenon of peak spreading, wherein peak conditions stretch over longer periods of the day as congestion rises. It was also intended to allow capacity limitations during the single hour to become more severe in order to allow transit, flex-time, and other modal options to affect corridor traffic demand.

As the WFRC model relies on a full 3-hour peak period, the forecast of highway and transit use are estimated on the basis of consistent factors and provide a useful comparison of maximum future transit use over the full period. Capacity estimates expressed in the Supplemental EIS are based on peak hour values and procedures described in the Highway Capacity Manual but reflect average conditions over a peak period.

Table B-9 TSM/TDM/ITS Review

Category	Technique	Analysis Considerations	Method of Incorporation in Modeling
TSM	Ramp Metering	Effects on highway segments between interchanges accounted for in lane capacity assumptions.	Reflected in post-model capacity analysis, by assuming dense uniform flow downstream of on-ramps.
ITS	Variable Message Signs	SEIS capacity analysis represents conditions on days when no incidents occur. Variable message signs would help mitigate incident effects on days when they do occur, but would not make conditions better than incident-free days.	Addressed in discussion of need for alternate route to respond to incident and emergency needs, not in quantitative analysis of average-day conditions.
ITS	On-Board Navigation	SEIS capacity analysis represents conditions on days when no incidents occur. On board navigation would help mitigate incident effects on days when they do occur, but would not make conditions better than incident-free days.	Addressed in discussion of need for alternate route to respond to incident and emergency needs, not in quantitative analysis of average-day conditions.
TSM	Incident Management	SEIS capacity analysis represents conditions on days when no incidents occur. Incident management would help mitigate incident effects on days when they do occur, but would not make conditions better than incident-free days.	Addressed in discussion of need for alternate route to respond to incident and emergency needs, not in quantitative analysis of average- day conditions.
TSM	Auxiliary Lanes	Auxiliary lanes specifically accounted for in highway segment capacity analysis.	Accounted for in model highway networks and in post-model capacity analysis
TDM	Transit Promotion	Transit fare discounts and other TDM accounted for in modeling and off-model adjustments.	Accounted for in model transit networks and operating parameters, including fare structure and transit frequencies.
TDM	Carpool Promotion	Current levels of promotion, along with parking pricing and carpool lanes accounted for in modeling.	Accounted for in model networks and operating characteristics, including presence of HOV lanes and parking pricing.

Category	Technique	Analysis Considerations	Method of Incorporation in Modeling
TDM	Variable Work Hours	Existing rate captured in model calibration.	Variable work arrival/departure times accounted for in post-model analysis of demand spread over three-hour peak period.
TDM	Telecommuting	Existing rate captured in model calibration.	Existing levels of telecommute adoption accounted for in model trip generation rates for different employment types and trip purposes.
TSM	Signal Coordination	Arterial capacity assumptions used in analysis assume reasonable levels of signal coordination.	Accounted for in model network capacities and post-model capacity analysis.
TSM	Dynamic Signal Systems	Arterial capacity assumptions used in analysis assume reasonable achievable levels of dynamic traffic signal management.	Accounted for in model network capacities and post-model capacity analysis.
TDM	Truck Restrictions	Effects of trucks included in capacity analysis through heavy vehicle factor.	Included in post-model capacity analysis.
TDM	Van Pool Incentives	Current levels of promotion, along with parking pricing and new HOV lanes accounted for in modeling.	Accounted for in model networks and operating characteristics, including presence of HOV lanes and parking pricing.
TDM	Transit Financial Incentives	Transit fare discounts included in modeling of Maximum Future Transit.	Modeling included reduction of premium transit fares.
TDM	Parking Costs	Potential for increased parking cost included in modeling analysis.	Modeling included increased parking costs by 50% to 100% above inflation-based increase.
TDM/TSM	HOV Lanes	HOV lanes accounted for in modeling and in post-model analysis of assigning traffic to each lane.	Accounted for in modeling and in post-model analysis of lane utilization and capacity.
TSM	HOT Lanes*	Strategy not considered.	Not assumed in modeling.
TDM	Park and Ride Construction	Included in modeling.	Included in transit access mode coding within model.
TSM	Peak Spreading	Accounted for through averaging of peak-period demand over three-hour period.	Model estimates peak-period demand as a percentage of daily. Post-model capacity analysis addressed traffic spread over the three-hour peak period rather than concentrated in a single peak hour.
TSM	Reversible Lanes	Included in modeling (as appropriate to the alternative).	Accounted for in model networks and in post-model analysis of lane utilization and capacity.
TDM	Non-Motorized Travel	Post-model adjustments applied for scenarios that include higher levels of accommodation for bike and walk modes than presently found in similar areas of the region.	Empirical evidence on the reduction in auto travel resulting from increased development density, land use mix and urban design used to factor vehicle trips to lower levels than standard model trip generation rates.

* HOT lanes are high-occupancy toll lanes. Under this strategy, high-occupancy vehicle (HOV) lanes are made available to single-occupancy vehicles (SOV) at a price. Tolls are charged to SOVs based on time-of-day and level of congestion, so that the value of travel time savings correlates with the cost of toll.

B.4.3.2 Heavy Vehicle Factor

Capacity analysis for freeways as per the methods of the Highway Capacity Manual (HCM) (Transportation Research Board 2000, Chapter 23, page 23-7) recommends that hourly volumes be divided by a peak-hour factor, a heavy-vehicle factor, and a driver-population factor to account for the percentage of large (heavy) vehicles using a freeway. Heavy vehicles (trucks) affect traffic flow by consuming a greater amount of capacity per vehicle than passenger cars. Table B-10 presents the resulting heavy-vehicle factor. Heavy vehicles currently comprise approximately 3 percent of peak-period traffic on I-15. As traffic volumes increase in a developed area, truck traffic generally spreads to off-peak times of day, and peak concentrations diminish. This traffic analysis takes a conservative approach and assumes that this percentage remains constant in the future.

A heavy-vehicle factor of 0.99 was used in the 2020 analysis. Lower factors, corresponding to higher truck percentages, could have been used without affecting the conclusions of the analysis.

Table B-10. Heavy Vehicle Adjustment Factor

Period	Heavy Vehicle Factor
Existing Peak Hour	0.99
Existing Peak 3-Hour Period	0.98

B.4.3.3 Peak Hour Factor

Capacity and LOS analysis in the HCM normally addresses conditions in the peak 15-minutes of the peak hour of a typical or “design” day. UDOT’s objectives for the north corridor are to provide acceptable traffic LOS on average through the peak hour or three-hour peak period on a typical weekday. Other State Departments of Transportation, including Florida, Arizona, Colorado, and Oregon also suggest that LOS goals should apply over average extended periods of time rather than to all traffic over all time periods as short as 15 minutes. Based on scoping for the Supplemental EIS, UDOT has not utilized the most congested 15 minutes of the peak hour for the Legacy Parkway. Therefore, Level of Service Analysis presented for the Legacy Parkway reflects an average peak hour (used in the integration analysis) and average peak period condition (used in the alternatives analysis), and does not use a peak-hour factor.

B.4.3.4 Driver Population Factor

A driver population factor of 1.0 was used to reflect the commuter nature of the area, as suggested in the HCM, 2000.

B4.3.5 HOV Analysis

Limited analysis of HOV lanes is presently supported by the WFRC travel demand model through the trip distribution, mode choice, and assignment steps. While they may have higher person-trip capacity than general purpose lanes, HOV lanes have lower vehicle capacity than general purpose lanes, because HOV lanes are operated in a manner that provides better LOS than the general lanes by limiting the lane use. A manual step is required to ensure that the assumed capacity of the HOV lane is maintained; the lane is coded with a maximum capacity without congestion of 1,680 passenger car equivalents (pces) per hour. The use of the HOV lane was assumed to reduce the demand of other general purpose lanes.

B.5 Supporting Results

Significant analysis was developed which aided in the understanding of each alternative to the Legacy Parkway. Some of the alternatives included in this write-up were addressed but not advanced in the Supplemental EIS. Although these alternatives were not advanced, it was the opinion of the lead federal agencies that full disclosure of all analysis was appropriate.

B.5.1 Possible Land Use Shifts under No-Build Alternative

As discussed in land use topic in the Supplemental EIS Section 4.1.3.3 (*Impacts on Growth within and beyond the North Corridor)*, if Legacy Parkway were not built, approximately 800 acres of developable land in uplands above the floodplain would become available for development in North Salt Lake, Centerville, Farmington, Woods Cross, Bountiful, and West Bountiful if Legacy Parkway were not built. The land is located within the protected right-of-way for the Legacy Parkway, and within the proposed project-sponsored nature Preserve, generally west of existing and developing areas. Under the No-Build Alternative, UDOT would lack authority to keep the right-of-way or the Preserve; thus the land would be available for development. Based on a review of historic zoning and on interviews with planning staff with each City, an estimated 100 to 200 acres would be developed under residential uses at approximately five units per acre. The remainder of the 800 acres would develop under retail, commercial, business-park, warehouse and manufacturing use. City planning representatives also state that real estate market activity within their communities and the properties' strategic location within the region, near the airport and regional CBD suggest that the land would develop in the relatively near term, prior to 2020. The planners also believe that the development would represent net additional development within their communities rather than spreading the same amount of development that would otherwise occur at lower densities over larger areas.

There are no official assessments of the degree to which these changes in land availability might effect the officially adopted regional land use projections and city-by-city allocations prepared by the Utah Governor's Office of Planning and Budget and Wasatch Front Regional Council. The 800 additional acres represents a very small percentage of county wide and regional development over the study period. It is equivalent to less than 6 percent of the projected 20 year growth within the Study Area. From 2000 to 2020, local planners project a 20-year total of about 14,000 acres at the rates projected by local planners in Section 4.1.2.1 *Current Land Use and Development Trends in the Study Area*. It is less than 1 percent of Wasatch Front four-county population growth. Considering the regional land supply, variations in economic conditions and land values and variable demand for specific types of use at specific locations, it is uncertain the extent to which the additional land will:

- reduce development densities within the corridor
- delay market absorption of certain corridor lands until beyond 2020
- slow some development in cities north of the North Corridor until beyond 2020
- shift development into the additional corridor lands from other parts of the region

It is unlikely that the small percentage increase in available land within the region will affect the amount of population or employment within the region. Therefore, the change could only result in changes in development within the North Corridor cities that falls somewhere in the following possible range.

- At the minimum end of the possible range of outcomes, the change in the corridor would be negligible. This would occur if the primary consequences of the additional developable acreage were reduced development densities within the corridor and/or no increase in market absorption rates for corridor lands. This would result in a zero net gain in development of the North Corridor under the No-Build scenario compared to the Shared Solution.

- At the maximum end of the possible range of outcomes, an additional 800 acres of residential, commercial, and industrial development could occur within the corridor. This would occur if densities remained unchanged and absorption rates increased. Based on discussions with planning staff in the affected cities, the additional development could amount to up to 500 additional dwelling units and up to 8,700 commercial and industrial employees within the developable areas of the right-of-way and Preserve.

If the maximum shift occurs and an additional 800 acres do develop within the corridor by 2020, there would be an equivalent reduction in development elsewhere in the region, outside the corridor. If growth and development shifts within the area, it is possible that some or all of the development shifted into the corridor would come from areas north of the corridor, including north Davis and Weber Counties. Table B-11 presents a range of possible assumptions and projections on how such development shifts under the No-Build Alternative, if they occurred, might affect travel demand.

Table B-11. Possible Future Development Scenarios under the No-Build Alternative

	Development Scenario with **Low Effect** on Woods Cross Screenline	Development Scenario with **Moderate Effect** on Woods Cross Screenline	Development Scenario with **High Effect** on Woods Cross Screenline
Development response to additional 800 acres available in the North Corridor relative to Shared Solution	No increase in market absorption. Spread of officially-projected south Davis County development over larger area at lower densities.	Development shifts from North Davis and Weber Counties to absorb all 800 acres in south Davis due to more central regional location, reducing development north of the corridor in north Davis and Weber Counties.	Regional development shifts to absorb all 800 acres due to strategic regional location, reducing development elsewhere in the region, including proportional reductions in North Davis and Weber Counties.
Changes in Development Acres			
Additional acres of development within south Davis County relative to Shared Solution	0	+800 acres	+800 acres
Change in development in north Davis and Weber Counties relative to Shared Solution	0	-800 acres	- 160 acres[1]
Change in development elsewhere in the region	0	0	-640 acres
Change in regional development	0	0	0
Changes in Locations of Trip Generation			
Additional peak period trips generated in south Davis County relative to Shared Solution	0	+9500[2]	+9500[2]
Reduction in peak period trips generated in north Davis and Weber Counties relative to Shared Solution	0	-9500	-1900[1]
Changes in Traffic at Woods Cross Screenline			
Net change in south Davis trips at Woods Cross screenline	0	+2850[3]	+2850[3]
Net change in north			

	Development Scenario with **Low Effect** on Woods Cross Screenline	Development Scenario with **Moderate Effect** on Woods Cross Screenline	Development Scenario with **High Effect** on Woods Cross Screenline
Davis and Weber trips at Woods Cross screenline	0	-600[4]	-120[4]
Additional peak period 2-way trips crossing Woods Cross screenline relative to Shared Solution	0	+2250	+2730

Notes:

[1] North Davis and Weber represent about 20% of projected regional growth potential.

[2] Based on discussions with south Davis planning staffs, the additional acreage could generate about 500 dwelling units and up to 8,700 commercial and industrial employees. This translates to approximately 9500 PM peak period trips.

[3] Approximately 30% of trips generated in south Davis impact the screenline.

[4] Approximately 6% of trips generated in north Davis and Weber impact the screenline.

Under the No-Build Alternative, if development shifted to the Legacy Parkway and Preserve corridor, up to 9,500 additional peak period trips would be generated in south Davis County (based on WFRC model trip generation rates). Depending on the locations from which the development shifted, trip generation in north Davis and Weber Counties could reduce by between 1,900 and 9,500 peak-period trips. Most of the new traffic generated in north Davis and Weber Counties would remain local and would not traverse I-15 through the North Corridor. WFRC model trip distribution and directional percentages indicate that removing 800 acres or 9,500 peak-period trips from north Davis and Weber Counties translates to a reduction of roughly 120 to 600 peak-period, peak-direction passenger-car equivalents (pces) on I-15 at the Woods Cross screenline. However, these pces would be more than fully replaced by pces added to I-15 by the new trips generated by the additional 800 additional acres of development within the Legacy Parkway right-of-way and preserve. The net effect would be an increase of between 2,250 and 2,730 PM peak-period pces at the Woods Cross screenline under the No-Build Alternative. This increase would worsen the level of service, which even without the land use shift, would be LOS F in 2020 under the No-Build Alternative.

In addition to the impacts primarily affecting I-15 at the Woods Cross screenline, there would be an additional 9,500 peak period trips generated in the western portions of the North Corridor communities. This traffic would circulate on new local streets built within the Legacy Parkway right-of-way and Preserve and on existing surface streets such as Redwood Road, 500 South and Parrish Lane, resulting in higher impacts on those streets than under the Build Alternative. Consequently, by not assuming development in the land occupied by the right of way and the Preserve, the land use assumptions used in this Supplemental EIS for the No-Build Alternative represent the low end of the range of the potential 2020 conditions on I-15 and a potentially favorable assessment of the potential traffic conditions on surface streets in western areas of North Corridor communities. Relative to this favorable assessment, the land use shifts would worsen the 2020 LOS on I-15 at Woods Cross screenline to a worse LOS F than reported in Table 1-2 and Table 3-2 for the No-Build Alternative, and could increase traffic generation and local street construction in the western portions of North Salt Lake, Woods Cross, Centerville, Bountiful, West Bountiful and Farmington.

B.5.2 Through-Corridor Traffic on Local Streets

The travel model can identify traffic from various geographic origins and destinations. A useful analysis was to identify the component of traffic that had neither an origin nor a destination in the study area. Traffic that passed through the study area but had neither an origin nor a destination in the area was termed “through-corridor” traffic. According to the AASHTO Green Book, traffic traveling distances or ten miles or more (i.e., through traffic) should be afforded high-speed facilities with some degree of access control (American Association of State Highway and Transportation Officials 2004). Accident rates collected by UDOT reveal that limited access facilities, those facilities which do not have traffic signals, have accident rates that are less than one third those of signalized streets. However, like travel times, there is no binary threshold which is readily accepted as a pass-fail criteria to screen alternatives. Figure B-2 displays that the Shared Solution can eliminate through-corridor traffic on signalized streets, representing a measure of safety of the North Corridor transportation system.

B.5.3 Geographic Travel Markets

The geographic market of travel across the Woods Cross screenline was examined in order to gain a deeper understanding of the travel demand in the North Corridor. The geographic markets were examined using the WFRC travel model, which allows for the origin and destination traffic zone pairs of each trip to be identified. Three origin-destination pairs were identified as follows:

- Through-corridor traffic including all traffic with neither an origin nor destination in the North Corridor,
- CBD to and from North Corridor traffic, and
- Utah County and all of Salt Lake County outside of the CBD to and from the North Corridor.

The geographic distribution of total traffic generally follows the observed socioeconomic trends of the area represented by a decline in the share of travel to and from the Salt Lake CBD and a corresponding growth of travel to and from north Davis and Weber County as well as south and west Salt Lake County. According to Figure B-3, travel from the CBD to the North Corridor is almost 7 percent of the total travel across the Woods Cross screenline in 2001 but declines to approximately 5 percent in the year 2020. Through travel grows from less than 45 percent of the total travel across the Woods Cross screenline in 2001 to over 50 percent of the total travel in the year 2020. This 50 percent relates to all travel crossing the Woods Cross screenline on I-15 as well as surface streets. On I-15 itself, the through traffic percentage is higher: 65 percent. In the year 2020, changes in geographic travel markets can be observed between alternatives, but are generally very small such that each alternative in the year 2020 basically serves the same geographic market regardless of the construction of various facilities.

In addition to the shift in the geographic markets over time from 2001 to 2020, another observation about the geographic travel markets is related to the use of each component of the Shared Solution in the year 2020, compared with facility-by-facility use under the No-Build Alternative. As shown in Figures B-4a and B-4b, each component of the Shared Solution serves a different set of travel markets. Under the

Shared Solution, traffic on Legacy Parkway is made up almost entirely of through traffic and traffic to and from the North Corridor to western and southern Salt Lake County. By contrast, almost one quarter of travel demand using mass transit across the Woods Cross screenline is represented by the CBD to North Corridor geographic demand. The No-Build Alternative results in approximately 65 percent of the screenline demand on I-15 as through traffic, whose trips neither begin nor end in south Davis County. Due to the resulting congestion on I-15, the No-Build Alternative also produces approximately 15 percent of the travel on signalized arterial and collector streets as through traffic. This compares to the Shared Solution for which the additional capacity on the Legacy Parkway results in only 50 percent of the I-15 traffic to be through traffic, and no through traffic is served by signalized arterial and collector streets at the Woods Cross screenline. Figures B-4a and B-4b display the relative geographic demand of each facility type in the peak period and peak direction based on passenger car equivalents in the year 2020 under the No-Build and Shared Solution, respectively.

B.5.4 Evaluation of UBET Proposals for Transportation and Land Use

In March 2005, UBET submitted comments on the Legacy Parkway Draft Supplemental EIS. The comments described alternative transportation and land use concepts for the North Corridor. UBET suggested that the proposals would meet the Legacy Parkway purpose and need. The lead agencies conducted a thorough evaluation of the UBET concepts. The results are described in Chapter 3, *Alternatives*, in Volume 1, and Master Responses 5 and 6 in Volume 2 of the Final Supplemental EIS. Details on the analysis of the UBET concepts are presented in a technical memorandum, *Evaluation of UBET Proposals for North Corridor Transportation and Land Use* (Fehr & Peers 2005). The memorandum includes a review of specific aspects of traffic modeling assumptions and methodologies, discussion of alternative evaluation criteria for assessing project performance, analysis of UBET's proposed transportation alternative for the North Corridor, and evaluation of UBET's proposed shifts in future land use development within the region.

UBET's conclusion that the UBET Alternative would meet purpose and need is based on a number of errors. The conclusion is invalid for the following possible reasons.

- The travel model highway network analysis that UBET submitted does not accurately represent UBET's proposed alternative because it uses higher capacity facilities than were described in the definition of the UBET Alternative. That is, UBET apparently modeled a different set of road configurations than it described in its text version of the alternative. While UBET describes a four- to six-lane arterial as its proposed alternative, the UBET model analysis uses an eight-lane Redwood Road expressway, similar to Bangerter Highway, with higher right-of-way requirements, more local access, and higher community impacts than UBET described for its proposed alternative.

- The alternative analysis performed by UBET included incorrect reversible lane coding because access to the lanes was not restricted in any way, which led to the lanes operating without barriers to protect on-coming traffic. This error is likely to result in unrealistically high travel forecasts.

- The UBET analysis makes average vehicle occupancy (AVO) adjustments to the modeling that are not appropriate given the demonstrated ability of the WFRC model to produce valid AVO forecasts without further adjustments.

- The UBET analysis uses AVO forecasts that are unprecedented in both the Salt Lake region and other larger urban areas and that are contrary to the current trends in HOV use. That is, UBET's analysis assumed that HOV lanes would attract more persons per vehicle than the data supports.

The technical memorandum *Evaluation of UBET Proposals for North Corridor Transportation and Land Use* (Fehr & Peers 2005) reaches the following conclusions regarding UBET's comments.

- UBET comments critical of the Draft Supplemental EIS modeling analysis do not warrant changes to the evaluation procedures and would not change Draft Supplemental EIS conclusions on the relative performance of corridor alternatives.

- The additional evaluation criteria proposed by UBET would not change conclusions on the performance of either the Supplemental EIS alternatives or the UBET transportation network alternatives.

- Three versions of the UBET proposed transportation alternative were analyzed; none of them meets project purpose and need or other project objectives, and none perform as well as the Shared Solution with respect to other UBET-proposed criteria.

- UBET land use assumptions are not suitable for inclusion in the Supplemental EIS because as they are inconsistent with approved local and regional land use plans, policies, and forecasts.

B.6 References

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